5. WKBCH - Workbench CSCI

5.1 CSCI Overview

The Workbench is a set of application programs which implement the core functionality of the science user interface of the client. This includes requirements for locating and retrieving advertisements, data holdings, services, and a variety of documents. It also includes the capability to visualize data, either prior to requesting it (via browse image) or after it is delivered to the user's desktop. Other capabilities include the ability to send desktop objects via e-mail, to log and review transactions between the client and the external environment, to easily create hypertext documents, to provide comments and user feedback, to read and post news articles on an ECS bulletin board, to request definitions of ECS terms and acronyms, to configure the desktop environment and application-specific defaults, and to register for privileges beyond those of a guest.

In Release A, the System Level Version 0 Client, previously referred to as the V0 Client, was used to search and order data. **In Release B, two new tools will replace the V0 Client. The Earth Science Search Tool will search the Data Management CSCIs, such as the DIMs, LIMs, and DDICTs in order to provide the same functionality as the V0 Client.** V0 interoperability will be retained through the LIM interface to a V0 Gateway which will query the V0 IMS servers. **The Product Request Tool will provide the order function that in Release A is supported by the V0 client.**

5.2 CSCI Context

The context diagram for the Workbench CSCI is identical to that of the Client subsystem, since the Desktop CSCI has no external interfaces.

5.3 CSCI Structure

Table 5.3-1 provides a summary of the components which make up this CSCI, to the extent they are currently known. Since this CSCI is developed incrementally, the table presents our current best estimate of the CSCI components, but is likely to change as the CSCI evolves. Since the WKBCH CSCI does not contain any public classes used by formal track components, the internal object models are not documented here. Detailed descriptions of the CSCs listed in Table 5.3-1 are provided in the sections that follow. The shaded rows represent new CSCs that are added at Release B.

Table 5.3-1. WKBCH Components

Name	Description	Type (DEV or OTS)	Release
Earth Science Search Tool CSC	Submits and views results of searches to ECS components, such as DIMs, LIMs, SDSRVs, DDICT, etc.	DEV	B
Product Request Tool CSC	Order data either electronically or on media.	DEV	B
Hypertext Viewer CSC	HTML Viewer Application	OTS	A
Visualization (EOSView) CSC	HDF-EOS Data Viewer and Analysis Application	DEV	A & B
Data Dictionary Tool CSC	Provides search and access of data definitions stored in the data dictionary service.	DEV	B
Data Acquisition Request Tool CSC	Provides the ability to submit ASTER DARs to the ASTER GDS.	DEV	B
User Preferences Tool CSC	Allows user to specify default views of the interfaces as well as other settable attributes	DEV	B
E-mailer Tool CSC	Used to send desktop objects via electronic mail	OTS	B
Session Management Tool CSC	Allows the user to suspend, resume, terminate, or put sessions in the background as well as monitor the status of the requests currently being processed.	DEV	B
News Reader Tool CSC	USENET news reader to read ECS bulletin board	OTS	B
HyperText Authoring Tool CSC	Speeds the creation of HTML documents	OTS	B
Document Search Tool CSC	Provides search and access of guide documents stored in the Document Data Servers	DEV	B
User Registration Tool CSC	Allows a non-ECS user to request an ECS account and allows updates to individual's profile after he/she becomes a registered user.	DEV	B
Logger/Reviewer Tool CSC	Logs Client/Server transactions beween ESST and Data Dictionary and between ESST and Data Server. Also logs errors that occur in X-windows tools.	DEV	B
Comment/Survey Tool CSC	Allows the user to submit free form comments and user surveys on workbench applications/tools.	DEV	B
Data Production Request Tool CSC	Provides the ability to submit ASTER DPRs for on-demand ASTER products.	DEV	B

5.3.1 Earth Science Search Tool CSC

5.3.1.1 Purpose

The primary purpose of the Earth Science Search Tool (ESST) CSC is to execute search and access services on Earth Science data, thus the name. Following this definition and the definition of other search interfaces, confusion about how the user proceeds to find data within ECS arose. ESSTs scope expanded to include a general search interface for the entire set of searchable ECS components, including Science Data Servers (SDSRV), Distributed Information Managers (DIMs), Local Information Managers (LIMs), Document Data Servers (DDSRV), the Advertising Service (ADSRV), and the Data Dictionary Service (DDICT). The ESST at this time is an X11/Motif application program that communicates to remote servers using the CSS supplied Distributed Object Framework (DOF).

5.3.1.2 Description

The ESST is a dynamically configurable Motif interface. The ESST has an icon bar that contains access to attributes that can be specified for a search. The contents of the icon bar changes based on the category of search the user wishes to perform. The user may specify the general category of data that will be searched. The categories include the following:

- Earth Science data—This is any data collection that can be accessed by ECS. This includes ECS data products as well as those products accessible from interoperable partners such as V0 and NOAA.
- Advertisements—The Advertising service provides three types of advertisements: service, provider, and product.
- Data Definitions—The Data Dictionary Service contains definitions of data collections, attributes of the collections, and valid values.
- Guide Documents—Guide documents provide more detailed documents of products, instruments, satellites, etc. than can be found in either the Data Dictionary or the Advertising Service.

The default category of data is Earth Science data. The user may also configure the default icon bar that is to be presented for each data category. This is performed using the User Preferences Tool. For example, the user may only want to specify spatial and temporal characteristics and the geophysical parameter that he or she is interested in. The user would specify this using the User Preferences Tool. When the configuration is saved, it is reused as the default configuration for the ESST for the Earth Science Data category.

The ESST design is evolving based on new L4 requirements or implementation suggestions as a result of user feedback, so the particular uses described here can change during the EP process. There are mechanisms available to submit comments on the evolving design.

Each category of data search is discussed in the following subsections.

5.3.1.2.1 Earth Science Data

The ESST will use the User Preferences stored on the client to configure the default icon bar for the Earth Science Data category. The user can change this default using the Attribute Selection screen which is also used in the User Preferences Tool. Once the user has selected a group of values for the desired attributes, the ESST uses the Data Dictionary Service to determine which ECS component to send the request to. For example, suppose the user specified a geophysical parameter that was only supported by a particular MODIS product. If the MODIS product was only available at one Science Data Server, the ESST could route the query directly to that SDSRV. On the other hand, suppose the user specified 5 different geophysical parameters that were resident at 5 different SDSRVs across 3 sites. The ESST would have to route this query to a DIM that could access each of the SDSRVs.

The search that is executed is an asynchronous search using a session context, such that if disconnected for some reason, the client can ask the server to reconstruct the session and either resume processing or receive the results of the completed request. While the search is running, the status of the request is displayed to the user. The user can continue to use the search screen and submit more searches on potentially different sessions to different servers. The progress of each session is tracked in the Session Management Tool so that the user can monitor and manage these sessions separately.

When a results set returns, the user can view the individual results. The results are formatted in a collection organization initially. The user can open collections to see the individual data granule metadata within the collection. By opening and closing the collection level metadata, the user can manage the result screen space. The results screen also includes access to services that can be performed on the data identified. The ADSRV is used to determine the appropriate services for the appropriate collections. For example, a MODIS collection might have a different subsetting service than an AVHRR collection. The results screen makes the user aware of the valid services by showing toggle buttons at the appropriate services for the appropriate collections. The user can select the services to be executed and the granules to execute them on by selecting the toggle buttons. When the request is submitted, a group of commands is submitted to the same component that returned the original result. For example, if the query originally was executed by a DIM, the subsequent requests would go to that same DIM, using the same session (unless the user specifies to use a new session).

This access to data and services on the same results screen provides a form of context switching. For example, one of the services available for the collections returned could be access to a Guide document. Thus, the user could go directly from the results of an “inventory” type query to a Guide document.

5.3.1.2.2 Advertisements

The ESST can initiate searches on advertisements for both product advertisements and service advertisements. The product advertisement search is equivalent to a “directory” search. The service advertisement search reveals the services and the data that they operate on. In addition, basic information on data providers will be available (e.g., name, affiliation, contact information, URLs, etc.).

5.3.1.2.3 Data Definitions

A Data Definition search executed from ESST activates the HyperText Viewer with the results of a search of the Data Dictionary Service. The Data Dictionary Service can be navigated further without returning to the ESST.

5.3.1.2.4 Guide Documents

A Guide search executed from ESST will initiate a search that eventually executes at one or more Document Data Servers. The results are displayed in the Web browser and the Guide documents can be navigated according to the hyper links available.

5.3.2 Product Request Tool CSC

5.3.2.1 Purpose

The purpose of the Product Request Tool (PRT) is to provide the user with the capability to request data from a data provider. The PRT is a Motif application that can be initiated from the ESST or directly from the Desktop.

5.3.2.2 Description

When viewing a result set in the ESST, the user can select granules to execute the order service on. When the request is submitted, the PRT is initiated with the selected list of granules. The PRT allows the user to specify media or delivery mechanism. For example, some of the options might be an FTP pull of the data, an FTP push, or distribution on media such as 8 mm. An estimate of the cost is retrieved and displayed to the user and confirmation of the request is asked.

Another way that the PRT can be initiated is from the desktop given a Document Object or group of Document Objects that contain universal references (UR) to data granules. The PRT will be initiated with the information from the UR and the user will proceed as if the list of granules came from the ESST. In fact, the default action for a Document Object representing a granule UR is to initiate the PRT, with the appropriate granule displayed on the PRT screen.

A third way to initiate the PRT is with a UR to a data collection that can be ordered in one bulk request. For example, some data collections come as a set of CD-ROMs. The PRT can take the UR of the data collection and determine the server to send the request to.

5.3.3 Hypertext Viewer CSC

5.3.3.1 Purpose

The Hypertext Viewer CSC provides access to ECS provided services via HTTP/HTML protocols. Examples of such services include:

- o Advertising Client Interface
- o Context Sensitive Help Interface
- o User Profile Interface
- o User Registration Interface
- o Data Dictionary Interface

- Access to Guide Documents Interface
- ESST-Like Interface (reduced functionality to what the Web browser can support).

Due to the explosive growth of hypertext technology, a trade study was performed to determine the hypertext viewer requirements for the Client subsystem.The purposes of the Hypertext Viewing Tool trade study were:

- to find a hypertext viewer for use as part of the Client Workbench for displaying HTML documents;
- to provide general access for Client users to the World Wide Web; and
- to serve as the implementation mechanism for the Client's hypertext based user interface.

5.3.3.2 Description

The Hypertext Document Viewing Tool trade study was defined in DID 211, Trade-off Studies Analysis Data for the ECS project. The trade study was accomplished by evaluating the currently (Spring, 1995) available Graphical Web browsers. It resulted in the selection of Netscape Navigator. The following is a brief summary of the study.

This trade study was a joint project by ECS and University of Maryland at College Park (UMCP). UMCP provided technical expertise on OTSO, a systematic process for reusable software component selection; ECS performed searching of tools, and conducted hands-on evaluation. Criteria definition and results analyses were performed by both parties.

A total of over 30 tools were found during the search for possible tools. The search was carried out using the World Wide Web (WWW), as it was assumed such tools would most likely be found on the Web.

The tools were screened based on the following criteria:

- HTML level 3 compatibility. (the tool should support HTML level 3);
- Availability on Unix, Macintosh, and MS-Windows platforms;
- Popularity of the tool (the tool should be one of the most widely used tools); and
- Availability (a working version of the tool must be available).

The tools which passed the initial screening were evaluated in more detail. This was based on a set of hierarchical criteria. The evaluation phase included generating explicit and detailed definitions for these criteria. The actual evaluation consisted of a set of tests corresponding to the criteria. The rigorous criteria definitions allowed a consistent evaluation of the tools even though several evaluators were involved. Each tool was evaluated by two evaluators, and each evaluator wrote a report describing the performance of each tool in each of the tests. The rationale for redundancy in evaluation was to improve evaluation consistency.

Evaluation results were discussed in a meeting where all but one evaluator was present. Most of the conflicting observations and open issues were resolved during the meeting. All remaining issues were resolved through assigned action items. Definition for two of the evaluation criteria tests were changed, and some of the tests were dropped due to the unavailability of appropriate data. The evaluators also found that some of the evaluation test definitions were too general and were thus not well understood.

Finally the evaluation results were analyzed using two techniques: a commonly used weighted scoring technique, and a technique called Analytic Hierarchy Process (AHP). This two-fold analysis was performed to see whether the choice of scoring technique influenced the result. Although there were significant differences between the two methods, the outcome for best tool was the same in both techniques, namely Netscape.

In Release B, Netscape will be the recommended Web browser, but any HTML 3.0 browser will be supported. The industry trends will continually be monitored and prototyped during the incremental development track process to determine if modifications to this baseline need to be made. For example, PW2 included a HotJava implementation of Earth Science Data search and order functions to evaluate the technology and get user feedback on different implementation approaches. At this time, the Java language is not a viable option since it runs on limited platforms supported by only one browser. As the technology shifts towards a Java or Java-like implementation, the Motif clients may become obsolete at which time they will not be upgraded.

5.3.4 Data Visualization (EOSView) CSC

EOSView is an interactive tool for examining and verifying any and all HDF or HDF-EOS data files. It is designed to make it easy for the user to interactively see the contents of the HDF or HDF-EOS data file, and to visualize each of the listed components in an appropriate way.

EOSView provides the following groups of capabilities:

1. Selection of Data-The ECS Client will use EOSView to visualize browse images during the selection of data. The ECS Client and EOSView will execute simultaneously on the user workstation, and will communicate with each other via scripts.
2. Verification of Granules - EOSView will open and display the contents of all HDF and HDF-EOS files in outline format. When a single component in this list is selected, either the corresponding subcomponents are displayed, or a visualization of that component is displayed. EOSView will be available as a stand-alone application, which runs independently of the ECS Client, on all ECS mandated workstations.
3. Presentation and Analysis of Data - EOSView will be used to get EOS data into leading visualization and analysis systems. This is accomplished in two ways. The first way is by allowing the conversion of selected components of an HDF or HDF-EOS file into an external HDF, HDF-EOS, ASCII Text, or binary file. The second way is by the external scripting capability: Programs such as IDL from Research Systems could call EOSView to initiate these conversions remotely.

In Release B, EOSView will be integrated with the ESST and PRT. EOSView will be initiated through the scripts. From EOSView, looking at a browse image, the user will be able to specify that he or she wants to acquire this data. EOSView will communicate this back to the ESST or PRT. EOSView is designed to work on all ECS mandated platforms both as part of the ECS Client and as a standalone application. It is also designed to read all types of HDF data and all types of HDF-EOS data.

Documentation for EOSView can be found in: HDF-EOS Primer for Version 1 EOSDIS (175-WP-001-001) in Section 5.3.3.1 Purpose and Description.

5.3.5 Data Dictionary Tool CSC

5.3.5.1 Purpose

The Data Dictionary Tool CSC provides a Web interface to definitions in the DDICT service. Searches can be initiated from the Web browser or from the ESST as previously described. Aliases and Boolean operations will also be supported.

5.3.5.2 Description

The Data Dictionary Tool CSC can search the following types of information located in the DDICT service:

- Data Collection information including the attributes associated with the data collection. Guide documents for the data collection can be navigated to directly from the Data Collection search results.
- Instrument definitions including a description and spectrum bands for multi-spectral instruments.
- Satellite descriptions including instruments, orbital characteristics and operational periods.
- Geophysical parameter definitions including the description, vertical and horizontal resolution and units.
- Discipline description
- Archive Site description
- Glossary of terms
- Acronym list

The search results also shows interdependencies between terms. For example, the Data Collection results has links to the Instrument and Satellite descriptions if applicable.

The Data Dictionary Tool allows the user to search the DDICT service using free text expressions or the user can navigate the index of terms. All of the different navigational methods result in queries to the DDICT service.

The initial implementation of the Data Dictionary Tool CSC is being deployed in EP7.

5.3.6 Data Acquisition Request Tool CSC

5.3.6.1 Purpose

The Data Acquisition Request (DAR) Tool CSC is used to submit DARs for ASTER data.

5.3.6.2 Description

The DAR Tool CSC reuses many of the ESST components such as the spatial selection and coverage screen, the attribute icon bar, and the search specification area. The DAR Tool interfaces directly to the ASTER GDS system to query the planning and scheduling data and previously defined DARs (TBR). The ASTER GDS system provides an API to the ECS Release B Client Subsystem to implement this interface.

The user will be able to specify DAR parameters. Upon submission of the DAR, the user will be

allowed to specify a Data Production Request (DPR) for a higher level product that should result from the data acquired with the DAR. In this case, some subscriptions might be created on behalf of the user to facilitate the process of determining the Level 1B ASTER data that is required to create the higher level product. The user will also be given the option to subscribe to the Level 1A browse data. In this case, the user could look at the browse data before deciding to request the higher level product.

The DAR Tool is currently being prototyped, without the DPR capabilities. The ASTER Science Team Functional Requirements for Mission Operations is being used as a source of more detailed Level 4 requirements for the purpose of the prototype. The requirements will then be incorporated in the Client Subsystem L4 requirements based on lessons learned and user feedback. The prototype was introduced in PW2 and will be deployed for evaluation during the EP7 timeframe.

5.3.7 User Preferences Tool CSC

The User Preferences Tool CSC allows the user to specify preferences for the application interfaces. The EP6 User Preferences Tool included the ability to set the following preferences: (1) Default icon bar attributes, (2) Default result screen attributes, (3) Color schemes, (4) Web browser path, (5) Default map projection, and many more. This allows the user to set these preferences and have them reused during the next client invocation. As the incremental development track effort continues, additional user preferences will be added based on user feedback.

5.3.8 E-mailer Tool CSC

The Client subsystem has requirements to provide e-mail access to users. The E-mailer Tool is an off-the-shelf tool that is supplied with the client. The user is free to specify his/her own tool using the User Preferences Tool.

5.3.9 Session Management Tool CSC

The Session Management Tool CSC tracks the progress of sessions. It displays the total estimated time of completion and the current estimate of time elapsed. The currently executed steps in the request are also displayed so the user can determine how much of the request has already been processed. From this tool, the user can issue all the session control functions such as terminate the session, suspend the session, and resume the session. The Session Management Tool would also be used to connect back to sessions that previously initiated and left running in the background.

5.3.10 News Reader Tool CSC

The Client subsystem has requirements to give access to the ECS bulletin board from the ECS client. This News Reader will be an off-the-shelf component, probably from public domain.

5.3.11 HyperText Authoring Tool CSC

The Client subsystem must supply a HyperText Authoring tool to support users in the creation of documents. This is to be used in the production of documents that will be later inserted into ECS, but can be used for authoring any hypertext document. This will be an off-the-shelf tool, most likely from public domain.

5.3.12 Document Search Tool CSC

The Document Search Tool provides the user the capability to search and access guide documents that are stored in the Document Data Servers.

The Document Search Tool allows users to enter keywords to search for detailed document descriptions on a number of data collections and related entities. A Guide search will initiate a search via LIM that eventually executes at one or more Document Data Servers. The results are displayed in the Web browser and the Guide documents can be navigated according to the hyper links available.

5.3.13 User Registration Tool CSC

The User Registration Tool allows a non-ECS user to request an ECS account and allows updates to an individual's profile any time after registration. This tool was initially deployed as part of Evaluation Package 4 (EP4).

The User Registration Tool will be the entry point for a non-ECS user to request an ECS account. An ECS registration form will be provided to obtain user information which includes name, organization, and all the essential data required by the MSS. The registration information will be forwarded to MSS for verification and processing.

The User Profile Tool facilitates modification of user information. This information will be stored in the User Profile database maintained by MSS and will be used by all ECS applications.

5.3.14 Logger/Reviewer Tool CSC

The Logger/Reviewer Tool logs the Client/Server transactions between ESST and Data Dictionary and between ESST and Data Server. This tool also logs errors that occur in the X-windows tools.

5.3.15 Comment/Survey Tool CSC

The Comment/Survey Tool enables the user to submit on-line and real-time free-form textual comments and/or complete specific user surveys on the various workbench applications/tools. This tool was initially deployed as part of Evaluation Package 4 (EP4).

The Comment Survey Tool offers a means for ECS users to provide feedback to developers in an effort to build a better product. For each ECS application, there is a set of questions concerning the overall performance of the particular application. The user indicates on a scale of 1 to 5 their satisfaction. There is also a free text area provided for users to enter their own comments.

5.3.16 Data Production Request Tool CSC

As described in Section 5.3.6.2, a DPR for a higher level product will be specified and submitted upon the transfer of the necessary DARs (the latter acquiring the data). The DPR tool is currently being used as a source of more detailed Level 4 requirements for the purpose of the prototype. The requirements will then be incorporated in the Client Subsystem Level 4 requirements based on lessons learned and user feedback. The DPR prototype will be deployed for evaluation during the EP7 timeframe.